Scaling Giant Miscanthus Production & Use In The USA

EVENT: BIOMASS CANADA CLUSTER WEBINAR SERIES
DATE: JUNE 17th 2021
Growing Sustainable Solutions

AGgrow Tech is an innovative agricultural production and technology company focused on delivering improved environmental market solutions.
Giant Miscanthus Production

**SOCIAL**
- Highly Efficient Non-Food Crop
  - Perennial Grass: Plant once, stand lasting over 20 years.
  - Minimal nutrient, water and herbicide/pesticide requirements.
  - Heat and drought tolerant.
- New market opportunities
  - Creates jobs in rural America
- Alternative for marginal and under-utilized land

**ENVIRONMENTAL**
- Reduced Carbon Footprint
  - Removes 50% more carbon from the atmosphere and sequesters 94% more carbon in the soil than a pine plantation per acre per year.
- Soil Quality
  - Miscanthus ecosystems contain 67% more soil organic carbon than traditional row crop ecosystems.
- Water Quality
  - 90% reduction in Nitrate leaching vs traditional row crop ecosystems.
  - 30-60% decrease in soil erosion vs traditional row crop ecosystems.

**ECONOMIC**
- Price Stability
  - Long term stable feedstock cost for customers.
  - Stable returns for growers/landowners.
- Desirable Feedstock
  - Mature yields can range from 8 – 16 bone dry tons per acre. Three times more biomass per acre than pine plantation.
  - Consistent composition. Low moisture, highly absorbent, low ash and mineral content.
  - Less processing required to produce finished products.
So, what's the holdup?

Keys to Commercial Success
- Establishment at Scale
- Market uses
Technology

A patented precision agricultural system developed by AGgrow Tech to commercially plant and establish giant miscanthus.

ACCU Lifter™  ACCU Processor™  ACCU Drop™ Planter

Proprietary Genetics and Research Trials

Performance

Cost

VALIDATION

- 6,500+ acres established in ten states including North Carolina, Georgia, Mississippi, Maryland, Oklahoma, Iowa, Illinois, Indiana, Virginia and Wisconsin.
- 3 Issued Equipment Patents for Lifter, Processor and Planter
- AGgrow Tech owns the largest US miscanthus genetic germplasm libraries and the first commercial seeded variety of giant miscanthus. Germplasm includes 6 plant patents. (The Technology is a result of a $55MM investment from BP and Monsanto to further MxG genetic development. AGgrow purchased Assets from BP in 2014)
• Provides the ability to increase plant population.
• Improved stand density with 90+% of commercial acres planted reaching targeted plant population.
• Depending on planting date and location ACCU increased 1st year dt harvest yields by 50% to 500%.
• Reduced herbicide and weed management requirements.
Location: Soperton, GA (Middle Ga)
- Planted April 2010
- Stand age: 1 yr, (April 2011)
- Targeted PPA: 4840
- Actual PPA: 1936
- Spacing: 36\(^2\) x 36"
- % Establishment: 40%

Location: Dunn, NC (East Central NC)
- Planted: March 2013
- Stand age at photo: 4 months (July 2013)
- Targeted PPA: 13382
- Actual PPA: 11643
- Spacing: 18\(^2\) x 26"
- % Establishment: 96%
USES

“MARKETS”
Our Approach

We develop environmentally friendly products that provide value to our customers while creating new opportunities in rural America. Our sustainable approach includes partnering with stakeholders to grow a renewable resource and provide supply chain and manufacturing solutions to deliver a high-quality product.
Commercial Poultry Bedding

Total U.S. Market
Volume  2.9 million tons\(^1\)
Acres  250,000+

Chicken House
- 20 tons of Miscanthus Bedding Annually
- 1 house equals 2 acres of miscanthus

Turkey House
- 84 tons of Miscanthus Bedding Annually
- 1 house equals 7 acres of miscanthus

8.5 billion chickens annually
71,000 chicken houses

253 million turkeys annually
14,300 turkey houses

1. Material normalized to account for different usage rates.

CURRENT OPERATING LOCATIONS
Representing the Market
- #1 poultry producing state - North Carolina
- #1 broiler production state – Georgia
- #1 egg production state – Mississippi
- Locations represent 75% of the total poultry market
Poultry Bedding Growing Demand

Market Growth

USDA: "Agricultural Projections to 2025"

Poultry Market : Projected growth from 10 to 12% over next 10 years (5 billion pounds projected increase)

Consumer Push for Improved Food Safety

THE MARKET FOR MEAT AND POULTRY RAISED WITHOUT ROUTINE USE OF ANTIBIOTICS IS BOOMING
*Sales were up 25 percent, according to reporting published in 2012, over the three prior years.3
*USDA certified organic meats—just one part of the market for meat raised without routine use of antibiotics—were the fastest growing segment of the $31 billion organic foods industry in 2011.4

THE LARGEST CHICKEN BUYERS IN THE COUNTRY ARE RESPONDING
*In early 2015, McDonald’s, the largest and most iconic fast food chain in the United States, announced that within two years it would only serve chicken raised without use of medically important antibiotics across its approximately 14,000 domestic restaurants.10
*Chick-fil-A, which reports that it is the largest U.S. chicken chain by domestic sales volume,12 has committed to serve only 100 percent antibiotic-free chicken by 2019. The company announced that as of March 2015, it had already converted 20 percent of its chicken supply.13

Practices to Improve Animal Welfare

Chipotle Rolls Out New Animal Welfare Standards for Chickens
Triple Pundit (registration) (blog) - Jan 18, 2017
by Gina-Marie Cheeseman on Wednesday, Jan 18th, 2017 Food & Agriculture...
Chipotle Mexican Grill has improved its animal welfare standards for chickens yet again. ... Issues by aligning with the Global Animal Partnership’s (GAP) standards for broiler chickens. ... And that is a good thing for American farm animals.

Environmental

SANDERSON FARMS’ INNOVATIVE PARTNERSHIP WITH AGGROW TECH IS GOOD FOR POULTRY AND ENVIRONMENT

GREENSBORO, N.C. – May 16, 2017 – Sanderson Farms® continues its commitment to animal well-being by partnering with AGgrow Tech.
AGgrow Tech is the leader in supplying certified Sustainably Grown animal bedding fiber that comes from the production of Freedom® Giant Miscanthus. AGgrow Tech has established an additional 2,300 acres of Freedom® in eastern North Carolina specifically for the poultry market.
As part of this innovative initiative, AGgrow Tech will supply 1.8 million cubic feet of volume per year of premium bedding to Sanderson Farms.
*This investment into the birds’ well-being will provide a healthier environment to deliver the best possible conditions,* says Randy Pettus director of production for Sanderson Farms.

Strictly Confidential
Giant Miscanthus Vegetative Buffer

Vegetative Buffers

Environmental Benefits

• Air Quality
• Water Quality
• Energy Conservation
• Dust Control

ROADWAY BUFFER EXAMPLE
PROVIDES GREAT SCREENING AND A REDUCTION IN DUST

PERIMETER / TUNNEL FAN BUFFER EXAMPLE
IMPROVES AIR QUALITY AND ENERGY

PRODUCTION AREA ALSO ACTING AS BUFFER
IMPROVES AIR QUALITY

MxG Production Area
Retail Animal Bedding

AGgrow Bedding - produced from FREEDOM® Giant Miscanthus is an all-natural non processed product that offers high performance characteristics with a more economical supply approach. It is 3 times more absorbent than wood shavings, bio degradable, sap free, has soft material characteristics and is more cost and labor friendly.

- **Economical** – very long lasting.
- **Consistent** – 100% of the product is grown by our farmers and produced in our facilities.
- **Comfort** – Users report that horses can get up easily and do not damage limbs.
- **Saves Labor** – Needs less frequent changes of bedding.
- **Saves Money** – Save time cleaning out and use less material.
- **Natural** – We grow, harvest, and mill the product. No additives or chemicals are used.
- **Environmentally Friendly** – Miscanthus is grown to help reduce greenhouse gas production, it is renewable and efficient. 1 acre can produce 16 bone dry tons of material, which is enough material to fill a 35 12x12 stales with 6 inch of material.
- **University tested** – Testing has shown high absorption, a considerably lower microbiological load average and softer material characteristics.
LONG LASTING PROTECTION
Compared to traditional mulches, AG Garden Gold provides long lasting protection which is of paramount importance to provide soil protection, effective soil carbon building and residual weed control.

HOLDS MOISTURE
AG Garden Gold is natural in color and contains no harmful dyes. It’s light color absorbs considerably less incoming solar radiation than dark soils or dyed mulches. This advantage keeps soil temperatures more consistent throughout the day while improving moisture retention.

OPTIMAL PARTICLE SIZE DISTRIBUTION
The consistent size distribution provides effective layering to reduce evaporation while providing optimal oxygen to soil exchange. Unlike chunky wood mulch that typically provides less cross layering and much greater porosity.

REDUCED PEST RISK
AG Garden Gold is safer to apply on plants than some wood or other mulches which have been known to carry pathogens that can affect plant health. AG Garden Gold is all natural and safe for pets and humans.

NEUTRAL pH
Neutral pH is important because it affects the availability of nutrients. Many nutrients are not readily available to plants in highly alkaline or acidic soils. Mulches like pine needles, pine chip and pine bark which have a pH of 3.5 to 4.5 can contribute to acidic soils. Acidic pH Levels can decrease growth of beneficial soil Bacteria.

CERTIFICATIONS

AG Garden Gold
Organic Straw Mulch
AGGROW TECH AWARDED THE DEVELOPMENT CONTRACT FOR THE UNIVERSITY OF IOWA BIOMASS FUELS PROJECT

GIANT MISCANTHUS GRASS TO OFFSET 22,500 TONS OF COAL

Project Goal
To produce 25 percent of the required renewable energy needed to satisfy The University of Iowa’s 2025 goal of 0 percent coal at a price competitive with current fossil fuel supplies. Giant Miscanthus, a dedicated energy crop, will be established on 2,500 acres in Iowa to produce 22,500 tons of sustainable and renewable biopower feedstock to replace a portion of the University’s coal supply.

Progress
- 1,250 acres of giantmiscanthusBioFuel established
- BioFuel harvested and supplied to University Power Plant for combustion.
- Continued project acre expansion
- Project recognized for Governors Environmental Excellence Award

* Market size provided by Global Market Insights
Geotextiles / Erosion Control

PRODUCTS

Sediment Retention Devices

Straw Bales

Hydro-Mulch

Non-Woven Mats / Blankets

U.S. INFRASTRUCTURE NEEDS OVER THE NEXT 10 YEARS

<table>
<thead>
<tr>
<th>Category</th>
<th>Total Funding Needed</th>
<th>Funded</th>
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<tbody>
<tr>
<td>Streets, Roads</td>
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<tr>
<td>Electricity</td>
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<td>Schools</td>
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<td>Water, Wastewater</td>
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<td>Parks, Recreation</td>
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<td>Levees</td>
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<td>Dams</td>
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<td>Waterways, Ports*</td>
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<td>Waste**</td>
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<td>Fortune Magazine</td>
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SOURCE: AMERICAN SOCIETY OF CIVIL ENGINEERS, CONSTANT 2015 DOLLARS

* Inland   ** Hazardous and Solid Waste
Future Eco-Friendly Products

Horticulture Market
- Planting Pots
- Substrate Media

Petcare
- All-Natural Cat Litter

Building Materials
- Insulation
- Fiber / Particleboard
- Flooring / Bio Composites
- Additive for Light Weight Concrete

Biomaterials
- Bioplastic
- Food Packaging / Pulp Based Consumer Products
- Biochar
- Ingredients
THANK YOU

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